ICAO ENGINE nvPM EMISSIONS DATA SHEET

SUBSONIC ENGINES

ENGINE IDENTIFICATION:	Trent7000-72	BYPASS RATIO (-):	9.1
UNIQUE ID NUMBER:	04P24RR146	PRESSURE RATIO π_{oo} (-):	44.6
COMBUSTOR:	Phase5 Tiled (Improved nvPM combustor)		
ENGINE TYPE:	TF	RATED OUTPUT F_{oo} (kN):	327.9

REGULATORY DATA

CHARACTERISTIC VALUES:	LTO_{mass}/F_{oo} (mg/kN)	LTO_{num}/F_{oo} (particles/kN)	NVPM MASS CONCENTRATION ($\mu g/m^3$)
LTO/F_{oo} AND MAX $nvPM_{mass}$	90.4	1.13E+15	1690
AS % OF CAEP/10 LIMIT	-	-	43.1
AS % OF CAEP/11 LIMIT (InP)	26.0	27.1	
AS % OF CAEP/11 LIMIT (NT)	42.2	40.7	

MEASURED DATA

MODE	POWER SETTING ($\%F_{oo}$)	TIME minutes	FUEL FLOW kg/s	EMISSIONS INDICES* EI_{mass} (mg/kg)	EMISSIONS INDICES* EI_{num} (particles/kg)	NVPM MASS CONCENTRATION PEAK $nvPM_{mass}$ ($\mu g/m^3$)
TAKE-OFF	100	0.7	2.477	32.8	1.32E+14	
CLIMB OUT	85	2.2	2.024	50.8	2.58E+14	
APPROACH	30	4.0	0.667	31.1	7.06E+14	
IDLE	7	26.0	0.256	10.7	3.33E+14	
LTO TOTAL (kg, mg, number of particles)			931	26246	3.29E+17	-
NUMBER OF ENGINES				3	3	3
NUMBER OF TESTS				5	5	5
AVERAGE LTO/F_{oo} VALUES (mg/kN, particles/kN)				80.0	1.00E+15	-
MAX EI VALUES (mg/kg, particles/kg) AND MAX MASS CONC.($\mu g/m^3$)				87.2	9.55E+14	1537

** Emissions Indices are corrected for thermophoretic loss and fuel hydrogen content*

DATA FOR EMISSIONS INVENTORIES (ESTIMATIONS FOR ENGINE EXIT PLANE VALUES)

MODE	POWER SETTING ($\%F_{oo}$)	CORRECTED EMISSIONS INDICES EI_{mass_SL} (mg/kg)	CORRECTED EMISSIONS INDICES EI_{num_SL} (particles/kg)
TAKE-OFF	100	38.3	1.96E+14
CLIMB OUT	85	59.3	3.95E+14
APPROACH	30	38.2	1.42E+15
IDLE	7	13.5	7.23E+14

AMBIENT CONDITIONS

	From	To
BAROMETER (kPa)	100.2	101.6
TEMPERATURE (K)	291.4	299.6
HUMIDITY (kg water/kg dry air)	0.0047	0.0099

FUEL

HEAT OF COMBUSTION (MJ/kg)	43.37
HYDROGEN CONTENT (%mass)	14.01
AROMATICS CONTENT (%vol)	16.1
NAPHTHALENE CONTENT(%vol)	0.18
SULPHUR CONTENT (ppm by mass)	300

MANUFACTURER:	Rolls-Royce plc
TEST ORGANIZATION:	Rolls-Royce plc
TEST LOCATION:	Derby
TEST DATES:	05/05/2020-11/09/2020

REMARKS

1. Certification Report EDNS01000945310
2. Improved nvPM combustor
3. The maximum EImass occurs between 30% and 85% Foo
4. The maximum EInum occurs between 30% and 85% Foo
5. Corrected peak EI number value (fuel correction) since EEDB v30